FUEL CAP DEVICE

This application is a CIP application based on US patent application No. 09/899,065, the entire contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a fuel cap device furnished with a fuel cap for opening and closing a pouring inlet of a fuel tank in an automobile.

2. Description of the Related Art

Conventionally, as this kind of fuel cap device, such a structure is known that a fuel cap having a gasket is rotated two or three times into or out of a filler neck connected to the fuel tank to open or close the pouring inlet. Since the operations of plural times of the fuel cap probably bring about an incompletely tightened condition, it is known for settling such occasions that an only rotation at a predetermined angle, e.g., 90° causes the fuel cap to close the pouring inlet of the filler neck.

Fig. 20 is an explanatory view showing a neighborhood of the pouring inlet disposed at the rear part of an automobile. In the same, there is provided a recess part 102 to be opened and closed by an oil cover 101 at the rear part of a car body

panel, and a pouring inlet 104 for a filler pipe is located in a bottom wall 102a thereof, and is sealed with a fuel cap 110. The fuel cap 110 has a casing (not shown) closing the pouring inlet 104 and a cover 114 attached to the casing. The cover 114 projects outward an operating portion 116. For closing the pouring inlet 104 with the fuel cap 110, the operating portion 116 is grasped with fingers of an operator to put the casing into the pouring inlet 104 and rotate the operating portion 116 about 90° in a clockwise direction, in short, till the position shown in Fig. 20.

In terms of safety of the automobile, it is important to prevent fuel leakage by protecting the fuel tank from damage at an unexpected collision of the automobile. In the recent years, manufactures of automobiles and equipment parts are required to conform and certify compliance with safety standards such as Federal Motor Vehicle Safety Standards (FMVSS, in particular FMVSS 301 for the safety of the fuel system).

The conventional fuel cap 110 has an outside edge 116a of the operating portion 116 directing rearwards of the automobile as shown in Figs. 21A and 21B when closing the pouring inlet 104. There has been involved with a problem about the prior art that, in case receiving a large external force Pw1 from the rearward as being rear-ended, the operating portion 116 rotates counterclockwise direction to easily loosen the

fuel cap 110.

More specifically, the fuel cap 110 is connected to the fuel tank (not-shown) through the inlet pipe (not-shown). As shown in Fig. 20, the pouring inlet 104 of the filler neck FN to which the fuel cap 110 is attached is often arranged on the body panel in the rear part of the automobile and the fuel tank is disposed under the compartment.

In such the automobile, there are three possible damage modes appearing on and around the fuel tank and the filler neck at the time of collision.

First damage mode is that the pouring inlet 104 of the filler neck FN is come off from the body panel by the inlet pipe is pulled in forward direction due to a force subjected to the fuel tank moving it in that direction when the automobile collides on the front side. In the first damage mode, although the cover 114 is detached, the filler neck FN is come off from the body panel while the casing of the fuel cap 110 remains closing the filler neck FN. Therefore the fuel leakage of the tank is prevented in many cases.

Second damage mode is that the body panel around the filler neck FN is deformed and it crashes onto the side face of the cover 114 of the fuel cap 110 when the automobile collides on the rear side. In the second damage mode, similarly to the first damage mode, although the cover 114 is detached, the filler neck FN is come off from the body panel while the casing of

the fuel cap 110 remains closing the filler neck FN. Therefore the fuel leakage of the tank is prevented in many cases.

Third damage mode is that the body panel around the filler neck FN is deformed and it crashes onto the operating portion 116 on the cover 114 of the fuel cap 110 when the automobile collides on the rear side.

In the third damage mode, it often happens that the casing of the fuel cap 110 is loosened on the filler neck FN, and the fuel leaks out of the tank.

In other words, it is possible that the body panel is deformed toward the front side of the vehicle and the crashing force acting on the operating portion 116 so that the cover 114 is rotated in the direction of opening the cap as shown in Figs. 21A and 21B.

In particular, the problem of loosening of the casing of the fuel cap is the most likely to appear in a case of a so-called quick type fuel cap, as described forgoing, which closes the pouring inlet of the filler neck by rotating at a predetermined angle not more than 180 degrees (e.g. about 90 degrees), without screwing the cap in plural turns.

One option to prevent the loosening of the casing is to provide a so-called lost motion mechanism, in which the cover and the casing is jointed though the torque releasing mechanism which allows relative rotation between the cover and the casing within a range less than predetermined angle (lost motion angle)

so that the torque for opening the casing is not transmitted from the cover, even in a case that the external force is subjected onto the operating portion. However, to provide the lost motion mechanism, the fuel cap should have unavoidably a complicated internal structure. Moreover, while the larger lost motion angle is better in terms of the safety of the fuel cap at the collision, the lost motion angle cannot be set so large in view of operational limitation since a redundant turning of the operating portion is required when the user opens the fuel cap.

The invention is to solve the technical problem of the prior art, and it is accordingly an object of the invention to provide a fuel cap device having a fuel cap enabling to open and close at small operating angles and being difficult to loosen by an unexpected external force.

SUMMARY OF THE INVENTION

For solving the above mentioned problem, the invention is to offer a fuel cap device disposed at a rear part of an automobile for opening and closing a pouring inlet connected to a fuel tank,

provided with a substantially cylindrical closer which is furnished to the pouring inlet,

an operating portion comprising a projection which is attached to the upper part of the closer and passes through

a center of the closer, bridging in a radius direction, and

sealing means intervening between the pouring inlet and the closer,

wherein the operating portion is rotated 180° or less from a state of attaching the closer to the pouring inlet, thereby to bring to a closing position sealed by the sealing means via the closer,

characterized in that where an external force exerting from the rear part of the automobile to the front part is received at a position which is at an outer peripheral edge of the operating portion and at a rearmost part of the automobile, the operating portion is determined to be at the closing position such that the operating portion transmits to the closer a moment rotating in the closing direction.

In the fuel cap device according to the invention, for causing the fuel cap to close the pouring inlet, grasping the operating portion of the fuel cap with the fingers to insert the closer thereof into the pouring inlet, the operating portion is rotated in the closing direction, so that the closer is rotated together with the operating portion to seal between the pouring inlet and the closer via the sealing means. The operating angle closing the fuel cap is as small as 180° or less and good in operation.

The outer circumferential edge of the operating portion is determined to be at the closing position such that the moment is transmitted in the closing direction from the operating portion to the closer, in case receiving an external force going from the rear side to the front side of the automobile when the fuel cap is closed. Accordingly, the outer circumferential edge of the operating portion receives the external force going from the rear side to the front side of the automobile, the fuel cap rotates in the closing direction, so that it is not loosened. Thus, even if the fuel cap receives the external force as being rear-ended, it can maintain the sealing function.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view showing the rear part of an automobile;

Fig. 2 is a perspective view enlarging the neighborhood of the fuel hole of Fig. 1;

Fig. 3 is a perspective view showing a state of taking off the fuel cap from the state of Fig. 2;

Fig. 4 is an explanatory view of the opening and closing of the fuel cap;

Fig. 5 is an explanatory view of the closing state of the fuel cap;

Figs. 6A and 6B are side views, partially in section, of the fuel cap shown in Fig. 9 along lines VIA and VIB;

Fig. 7A is an explanatory view of the relationship between the casing side retaining portion of the casing main body and the filler neck;

Figs. 7B and 7C are schematic views showing inner side face of the opening portion of the filler neck in connection with the casing side retaining part;

Fig. 7D is a sectional view in a vicinity of the gasket when the fuel cap is inserted into the filler neck;

Fig. 7E is a schematic view showing another example of inlet side retaining part;

Figs. 8A is an exploded perspective view showing peripheral parts of the torque mechanism, Fig. 8B is an enlarged explanatory view of a connection portion connecting a ring-shaped portion to the casing main body;

Fig. 9 is a cross sectional view showing the neighborhood of the torque mechanism;

Fig. 10 is an explanatory view of the operation of the torque mechanism together with opening and closing of the fuel cap;

Fig. 11 is an explanatory view of the operation continuing from Fig. 10;

Fig. 12 is an explanatory view of the operation continuing from Fig. 11;

Fig. 13 is an explanatory view of the operation continuing from Fig. 12;

Fig. 14 is an explanatory view of the operation continuing from

Fig. 13;

Fig. 15 is an explanatory view of the operation continuing from Fig. 14;

Fig. 16 is an explanatory view of the operation continuing from Fig. 15;

Fig. 17 is an explanatory view of the operation continuing from Fig. 16;

Fig. 18 is an explanatory view of the operation continuing from Fig. 17;

Fig. 19 is an explanatory view of the positional relation of closing the fuel cap concerned with the other embodiment;

Fig. 20 is an explanatory view showing a neighborhood of the pouring inlet disposed at the rear part of an existing automobile; and

Fig. 21A and 21B are explanatory views of the closing position of the existing fuel cap and damage of the fuel cap at the collision.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

For more clarifying the above mentioned structure and works of the invention, reference will be made to preferred embodiments of the invention as follows.

Fig. 1 is a perspective view showing the rear part of the automobile. Figs. 2 and 3 are views enlarging the neighborhood of the fuel hole of Fig. 1. Fig. 2 shows a state

of attaching the fuel cap, and Fig. 3 shows a state of taking off the fuel cap, respectively. In Figs. 1 to 3, at the rear part of a car body panel VP, a recess Pa is provided which opens and closes by an oil cover FL, while in a bottom wall Pb of the recess, a pouring inlet FNb (Fig. 3) of a filler neck FN is disposed. The pouring inlet FNb is sealed by the fuel cap 10. As shown in Fig. 3, the fuel cap 10 comprises a casing main body 20 (closer) closing the pouring inlet FNb, a cover 40 affixed to the casing main body 20, and a gasket (not shown) as a sealing means. The cover 40 projects the operating portion 42 for rotating the fuel cap 10 by grasping with the fingers of the operator. The operating portion 42 forms the projection passing the center of the casing main body 20 and bridging in the radius direction.

Figs. 4 and 5 are views explaining positional relations of the operating portion 42 when the fuel cap 10 opens and closes. A state that the operating portion 42 of the fuel cap 10 shown in Fig. 4 stands in a vertical direction is a position for inserting and removing the fuel cap 10, and as shown in Fig. 5 from Fig. 4, a position that the operating portion 42 rotates clockwise 120° is a closing position. At the closing position of the fuel cap 10, the automobile starts.

For closing the pouring inlet FNb with the fuel cap 10

from the state shown in Fig. 3, the operating portion 42 is grasped by the fingers to insert the casing main body 20 into the pouring inlet FNb. At this time, the longitudinal direction of the operating portion 42 is set vertical as shown in Fig. 4 to insert the casing main body 20 into the pouring inlet FNb. Subsequently, if the operating portion 42 rotates clockwise about 120°, the casing main body 20 rotates till the position of Fig. 5 together with the operating portion 42. The fuel cap 10 closes thereby the pouring inlet FNb under a condition that the gasket seals between the casing main body 20 and filler neck FN.

In the above practicing mode, the angle closing the fuel cap 10 is small as 120° or less, and the closing rotation does not require repetitions of several times and the operability is excellent.

Further, as shown in Fig. 5, the outer circumferential edge of the operating portion 42 is determined to be at the closing position of the fuel cap 10 such that the moment is transmitted in the closing direction from the operating portion 42 to the casing main body 20 in the closing direction (R1) in case receiving an external force Pw1 going from the rear side to the front side of the automobile when the fuel cap 10 is closed. Accordingly, the outer circumferential edge of the

operating portion 42 receives the external force going from the rear side to the front side of the automobile, the fuel cap 10 rotates in the closing direction, so that it does not loosen. Thus, even if the fuel cap 10 receives the external force as being rear-ended, it can maintain the sealing function.

Next, explanation will be made to a specific structure of the fuel cap 10, referring to Figs. side view6A to 18. Figs. 6A and 6B are side views, partially in section, of the fuel cap 10. The fuel cap 10 is mounted on the filler neck FN having the pouring inlet FNb supplying the fuel into a fuel tank (not shown), and comprises the casing main body 20 formed with a synthetic resin such as polyacetal, the cover 40 mounted on the casing main body 20 and formed with a synthetic resin such as nylon, a torque mechanism 80, and the gasket GS sealing between the casing main body 20 and the filer neck FN.

The gasket GS is furnished outside under a flange part 33 at the upper part of the casing main body 20. The gasket GS interposes between a seal holder 21a of the flange part 33 and the pouring inlet FNb of the filler neck FN, and serves as a sealing by being pushed toward the seal holder 21a when the fuel cap 10 is inlaid in the pouring inlet FNb.

The casing main body 20 is formed at the lower part of

outer periphery with a casing side retaining portion 20a. Fig. 7A is a view explaining the relationship between a casing side retaining portion 20a of the casing main body 20 and the filler neck FN. As shown in Fig. 7A, an opening side retaining portion FNc is formed on the inner periphery of the filler neck FN. In a part of the inner periphery of the opening side retaining portion FNc, a neck side inserting notch FNd is defined which enables the casing side retaining portion 20a of the fuel cap 10 to insert in an axial direction of the casing main body 20. Therefore, the casing side retaining portion 20a is aligned with the neck side inserting notch FNd, and if the fuel cap 10 is rotated at a predetermined angle (around 120°) under the condition where the fuel cap 10 is inserted into the filler neck FN, the casing side retaining portion 20a is engaged with the opening side retaining portion FNc, whereby the fuel cap 10 is attached to the filler neck FN.

Figs. 7B and 7C are schematic views showing inner side face of the opening portion of the filler neck FN in connection with the casing side retaining part 20a. Fig. 7D shows a sectional view in a vicinity of the gasket GS when the fuel cap 10 is inserted into the filler neck FN. As shown in Figs 7B and 7C, when the fuel cap 10 is inserted into the opening of the filler neck FN, the casing side retaining part 20a moves in the axial direction of the filler neck through the inserting notch FNd, so that the positional relation between the fuel

cap 10 and the filler neck FN is adjusted. As shown in Fig. 7B, the lower side of the opening side retaining part FNc and the upper side of the casing side retaining part 20a are formed in tapered faces. Accordingly, the casing side retaining part 20a is brought into sliding contact with the lower side of the opening side retaining part FNc. As shown in Fig. 7C, by rotating the fuel cap 10 in the closing direction after the fuel cap 10 is inserted into the filler neck FN, the casing side retaining part 20a is guided downward gradually by the opening side retaining part FNcso that the fuel cap 10 is also moved downward into the filler neck FN at a distance h shown in the figure.

The gasket GS which is mounted around the casing 20 is brought into contact with the opening part of the filler neck FN at the insertion of the fuel cap 10. By further rotating the fuel cap 10, the gasket GS is deformed so as to generate reaction force against the rotating operation of the fuel cap 10. The reaction force is increased as the fuel cap 10 is further rotated, the casing 20 is fixed at a predetermined rotational position (State in Fig. 11 as described later). When a additional torque is provided to the operating portion 142 of the fuel cap 10 at this stage, only the cover 40 rotates relatively to the casing 20 which is fixed on the filler neck FN (State in Fig. 13 as described later). At this time, the user is confirmed by moderation or click sound that the fuel cap 10 closes the filler neck FN when the cover side retaining part

146a goes over the plate side retaining part 194b as described later.

Incidentally, the position on which the casing 20 is fixed is provided by retaining and stopping the casing side retaining part 20a on the opening side retaining portion FNc at the predetermined position due to the reaction force generated by the contact between the gasket GS and the opening part of the filler neck FN in the embodiment. It is also possible to retain and stop the casing side retaining part 20a by abutting it with a stopper FNe projecting from the lower side of the opening side retaining portion FNc as shown in Fig. 7E. By providing the stopper FNe, excessive pressure to the gasket GS due to overturning of the operating portion can be avoided.

Turning back to Figs. 6A and 6B, the cover 40 is mounted rotatably and detachably on the flange part 33 at the upper part of the casing main body 20. That is, the cover 40 shown in Figs. 6A and 6B comprises a bottom wall 41, the operating portion 42 projecting to the outer wall of the bottom wall 41, and a side wall 43 formed in the outer circumference of the bottom wall 41. In the inside of the side wall 43, retaining projections 45 are provided at eight parts equidistantly following the circumference. If the retaining projections 45 engage an outer ring-shaped portion 33a of the flange part 33, which is connected to the casing main body 20 with connection

portions 33b arranged around the casing main body 20, the cover 40 is set to the casing main body 20.

Between the casing main boy 20 and the cover 40, a torque mechanism 80 is provided (Fig. 8A). The torque mechanism 80 gives moderation to the cover 40 if it receives more than predetermined rotation torque when the fuel cap 10 closes the pouring inlet FNb so as to confirm that the fuel cap 10 is mounted on the filler neck FN at a desired rotation torque.

Fig. 8A is dismantled perspective views showing peripheral parts of the torque mechanism 80. Fig. 9 is a cross sectional view showing the neighborhood of the torque mechanism 80. The torque mechanism 80 has elastic pieces 194 and others of the same shape around a rotary shaft of the cover 40 and the same working effects, and so explanation will be mainly made to members of a shown upper side.

As seen in Figs. 8A and 9, the torque mechanism 80 is equipped with main body side ribs 132 standing on an upper and outer circumference of the casing main body 20, a tubular axial part 146 of the cover 40, cover side retaining parts 146a, cover side trigger projections 147, a spring 182, and a torque plate 190. In short, the tubular axial part 146 stands at an inside center of the cover 40, and the outer circumference of the tubular

axial part 146 projects the cover side retaining parts 146a as mountains in cross section. For the inside circumference of the main body side rib 132, the cover side trigger projections 147 project in arc.

As shown in Figs. 8A, the ring shaped portion 33a is connected to the casing main body 20 with the connection portions 33b. The connection portions 33b are arranged around the casing main body 20 at positions dividing the outer circumference thereof into quarters. As shown in Figs. 6A, 6B and 8B, V-shaped grooves (two grooves in the figure) extending in circumferential direction of the casing main body are formed on upper surface of each connection portion 33b. By providing such the grooves on the connection portion 33b, the cross-section of the connection portion 33b is partially reduced. Accordingly, the cover 40 may be detached by breaking the connection portion 33b at the groove when the expected external force is subjected to the cover 40, thus the casing main body 20a would not be loosen at the time of collision. Incidentally, the shape of the groove is not limited to a V-shaped.

The spring 182 is a torsion spring which intervenes between the casing main body 20 and the cover 40, and is received within the tubular axial part 146, passing through the torque plate 190 so as to be thus present between the casing main body 20 and the cover 40 for storing a urging force when the cover 40

rotates clockwise.

The spring 182 is fixed by spring retaining portions 183 formed on the upper side of the casing 20 and the backside of the bottom wall 41 in the cover 40. The spring retaining portion 183 is formed in a cylindrical outer shape and has a groove 183a on an upper face of the cylindrical outer shape traversing at the center thereof. Both ends of the spring 182 are provided as linear parts extending to traverse the coil of the spring 182 along a radial direction. One of the ends of the spring 182 is inserted into the groove 183a of the spring retaining portion 183 and the coil of the spring 182 is fitted to the cylindrical outer shape of the spring retaining portion 183. By such the structure, the spring 182 is fixed against rotation so that the spring 182 provides rotational urging force.

The torque plate 190 is a thin disk formed of a resin having penetrating holes and guide parts around the rotary shaft of the cover 40. That is, the center of the torque plate 190 is defined with a center hole 191 for passing the tubular axial part 146 of the cover 40 and formed with the elastic torque pieces 194 on a peripheral edge portion of the center hole 191. The elastic torque piece 194 has a fulcrum at a one-sided or cantilevered supporting edge 194a shaped in arc, projects the plate side retaining part 194b toward the inside circumference, and has a leg part 194d formed at a free end side.

The torque plate 190 is defined with arc shaped rib guiding parts 193 for slidably disposing the main body side ribs 132 which reciprocate between pressing edges 193a and 193b being both edges of the rib guiding parts 193. The main body side rib 132 is an arc shaped member following the rib guiding part 193, and has retaining projections 132a, 132b in the inside circumference. At the inside circumference of the main body side rib 132 and between the retaining projections 132a and 132b, guide parts 132c are formed for slidably supporting the cover side trigger projections 147. At the right side of the retaining projection 132a of the drawing and at the left side of the retaining projection 132b of the same, supporting edges 132e, 132f are formed respectively, the supporting edge 132e being for supporting the legs 194d of the elastic torque pieces 194.

Operation of the torque mechanism 80 will be referred to. Figs. 10 to 18 are views explaining operations of the torque mechanism 80 together with opening and closing of the fuel cap 10. Figs. 10 to 14 show operations until closing of the fuel cap 10, and Figs. 14 to 18 show operations until opening of the same. In them, the upper side figures show the positional relations of the cover 40, the central figures show the positional relations of the torque plate 190 being main, and the lower side figures show the positional relations between

the casing side retaining part 20a of the casing main body 20 and the neck side inserting notch FNd.

As shown in Fig. 10, while the pouring inlet FNd opens, the operating portion 42 of the cover 40 is held by the thumb and the forefinger so as to align the casing side retaining part 20a of the casing main body 20 to the neck side inserting notch FNd of the filler neck FN and insert the axial direction. Then, if the operating portion 42 of the cover 40 is vertically directed, the casing side retaining part 20a and the neck side inserting notch FNd are brought to a position enabling to insert, thereby to provide a positional relation easy to attach the fuel cap 10. The positional relation of the torque mechanism 80 at this time is brought by the urging force of the spring 182 to the position where the main body side rib 132 is engaged with the elastic torque piece 194, i.e., to the position under the condition where the leg 194d of the elastic torque piece 194 is supported by the supporting edge 132e of the main body rib 132.

If giving the rotating force in the clockwise direction to the cover 40 from the above mentioned state, the torque mechanism 80 makes a series of operations as shown from Figs. 10 to 14. That is, the clockwise rotating force given to the cover 40 is transmitted to the torque plate 190 via the engagement

between the cover side retaining portion 146a of the cover 40 and the plate side retaining part 194b of the torque plate 190, so as to rotate the torque plate 190 in the same direction. Accompanied with the rotation of the torque plate 190, the main body side rib 132 is pushed by the leg 194d of the elastic piece 194. Then, the cover 40, the torque plate 190, and the casing main body 20 are rotated about 100° together to close the pouring inlet FNb, and the casing side retaining part 20a is in engagement with the opening side retaining part FNc (State in Fig. 11). When reaction force generated in the cover 40 by the engaging force exceeds a predetermined rotation torque, the cover side retaining part 146a bends the elastic torque piece 194 (State in Fig. 12), and further going beyond the plate side retaining part 194b, a first attaching-detaching condition is thus made (State in Fig. 13). In this attaching- detaching condition, the cover 40 rotates about 30°, and when passing this condition, a user can confirm the moderation.
Namely, as the elastic torque piece 194 is supported by the supporting edge 132e of the main body side rib 132 at the leg 194d, it is difficult to bend, and the rotation torque for the cover side retaining part 146a to go over the plate side retaining part 194b is large, and the moderation can be ascertained.

When the cover side retaining part 146a goes over the plate side retaining part 194b, in short, when the cover 40

rotates relatively with the casing main body 20, the spring 182 expanding therebetween is twisted by about 30° to store the urging force (refer to Fig. 13).

The urging force accumulated in the spring 182 rotates the cover 40 counterclockwise by releasing the operator's hands from the operating portion 42 of the cover 40. In other words, the urging force of the spring 182 rotates counterclockwise the cover 40 and the torque plate 190 via the engagement between the cover side retaining portion 146a and the plate side retaining part 194b. At this time, as the casing main body 20 is secured to the filler neck FN, the main body side rib 132 integral with the casing main body 20 is also secured. Under this state, if the torque plate 190 rotates counterclockwise, the leg 194d of the elastic torque piece 194 separates from the supporting edge 132e of the main body rib 132, and the elastic torque piece 194 is of cantilever (State in Fig. 14). Further the cover 40 is secured in a state where the pressing edge 193b of the rib guide part 193 is brought into abutment with the main body side rib 132. Under this state, the fuel cap 10 closes the pouring inlet FNb (refer to Fig. 5). By adjusting a position on which the pressing edge 193b of the rib guide part 193 is formed, the securing angle of the operating part 42 may be predetermined. Therefore the cover 40 and the casing main body 20 are retained having a predetermined relative angle a for

a lost motion between the cover 40 and the casing main body 20 as shown in Fig. 14, when the fuel cap 10 closes the pouring inlet FNb. By such a structure, loosing of the cap by a large external force at the crush of the automobile and the like is effectively prevented.

Incidentally, if a setting load of the spring 182 for urging the cover 40 in counterclockwise direction is provided sufficiently large, the urging force accumulated in the spring 182 further rotates the cover 40, and the cover side retaining portion 146a goes through the plate side retaining part 194b, when the operator's hand is released from the operating portion 42 of the cover 40. Then, the cover 40 is rotated separated from the torque plate 190, and secured in a state where the cover side trigger projection 147 is brought in to abutment with the retaining projection 132a (State in Fig. 16).

In other words, the cover 40 recovers to an initial position with respect to the casing main body 20. Under this state, the fuel cap 10 closes the pouring inlet FNb (refer to Fig. 5) without forming angle for a lost motion.

The total rotation angle of the cover 40 after the operator's hand is released from the operation portion 42 makes an angle b shown in Fig. 16. In this case, if the position of the neck side inserting notch FNd is provided by offsetting 20° to 30° in the clockwise direction, the operating portion

42 can be set at the desired position.

On the other hand, for opening the fuel cap 10, the operating portion 42 of the cover 40 is held by the fingers to give to the operating portion 42 the counterclockwise rotation from the state shown in Fig. 14. As the elastic torque piece 194 is of cantilever, the cover side retaining part 146a easily goes beyond the plate side retaining part 194b (State in Fig. 15).

When the cover side trigger projection 147 contacts the retaining projection 132a to rotate the main body side rib 132 and support the leg 194d of the elastic torque piece 194 by means of the retaining projection 132a, the cover 40, the torque plate 190 and the casing main body 20 are, under this state, ready for rotating counterclockwise together (State in Fig. 17). If rotating the cover 40 further counterclockwise and returning to the state of Fig. 10 via the state of Fig. 18, the casing side retaining part 20a gets out from the opening side retaining part FNc of the filler neck FN, and the fuel cap 10 is going to slip out from the filler neck FN. Then, the positional relation between the operating portion 42 of the cover 40 and the casing side retaining part 20a of the casing main body 20 recovers to an initial state.

In the course of the closing operation of the fuel cap 10, the moderation can be ascertained when the cover side retaining part 146a of the cover 40 goes beyond the plate side retaining part 194b of the torque plate 190, and as it is seen that the fuel cap 10 is tightened at a predetermined torque, the tightening at the constant torque is available, irrespective of elasticity of the gasket.

Besides, the fuel cap 10 is sufficiently operated at the small rotating angle as about 140° through the engagement between the casing side retaining part 20a and the opening side retaining part FNc, and rotating operations of several times are not requisite, and the attaching operation is simple.

Moreover, since the cover 40 and the casing main body 20 can be retained having a relative angle with each other by the torque mechanism 80, the securing angle of the operating part 42 can be set at a desired angle irrespective of the engagement state between the pouring inlet FN and the casing main body 20.

The invention should not be limited to the above mentioned embodiments, and so far as not getting out the subject matter, various modifications are practicable, and for example, the following modifications are available.

(1) In Fig. 19, the operating portion 42 receives the external force at the rear part of the automobile, and for rotating the fuel cap 10 in the closing direction, it is sufficient that the end of the operating portion positions within the range of 90° of the angle α, and preferably $\beta 1$ is 5° or more, $\beta 2$ is 40° or more, specially preferably, $\beta 1$ is 10° or more, and $\beta 2$ is 45° or more.

(2) For bringing the fuel cap to the closing position by rotating 180°or less, other than the structures explained with Figs. 9 to 18, various structures may be adopted without limit. For example, if determining a setting load of the spring 182 concerned with the above mentioned practices, such a structure may be enough which returns from the state of Fig. 14 to the state of Fig. 16, when the closed fuel cap is released. Thereby, click-feeling when opening the fuel cap can be removed, and the operation can be heightened. In this case, if sliding the position of the neck side inserting notch FNd 20° to 30° in the clockwise direction, the operating portion 42 can be set at the desired position.